

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
19 February 2004 (19.02.2004)

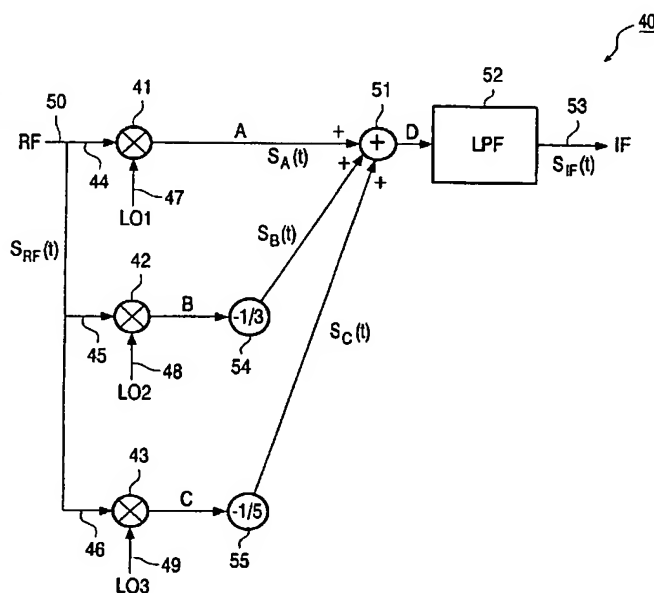
PCT

(10) International Publication Number
WO 2004/015439 A3

- (51) International Patent Classification⁷: **H03D 7/00**
- (21) International Application Number: **PCT/IB2003/003138**
- (22) International Filing Date: **5 August 2003 (05.08.2003)**
- (25) Filing Language: **English**
- (26) Publication Language: **English**
- (30) Priority Data:
02017848.9 **8 August 2002 (08.08.2002) EP**
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- (81) Designated States (national): **AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.**
- (84) Designated States (regional): **ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).**
- Published:**
— with international search report

[Continued on next page]

(54) Title: **IMPROVED MIXERS WITH A PLURALITY OF LOCAL OSCILLATORS AND SYSTEMS BASED THEREON**



(57) Abstract: Apparatus (40) for processing an input signal ($S_{RF}(t)$) with a carrier frequency (ω_{RF}) defining a desired band and at least a sideband being defined by a sideband frequency ($n\omega_{LO}$) that is higher than the carrier frequency (ω_{RF}). The apparatus (40) comprises a main input (50) for receiving said input signal ($S_{RF}(t)$) and a first standard mixer (41) having a first mixer input (44), a first local oscillator input (47), and a first mixer output (A). The first mixer input (44) is connected to the main input (50) and the first local oscillator input (47) is connected to a source that provides a first local oscillator signal (LO1) having a frequency (ω_{LO}). This frequency (ω_{LO}) is close to or equal to the carrier frequency (ω_{RF}). The first standard mixer (41) performs a multiplication of the input signal ($S_{RF}(t)$) and the first local oscillator signal (LO1) to provide a first output signal ($S_A(t)$) at the first mixer output (A). The apparatus (40) further comprises a second mixer (42) with a second mixer input (45), a second local oscillator input (48), and a second mixer output (B). The second mixer input (45) is connected to the main input (50) and the second local oscillator input (48) is connected to a source that provides a second local oscillator signal (LO2) with the sideband frequency ($n\omega_{LO}$). The second mixer (42) performs a multiplication of the input signal ($S_{RF}(t)$) and the second local oscillator signal (LO2) to provide a second output signal ($S_B(t)$) at the second mixer output (B). There are means for superpositioning (51) the first output signal ($S_A(t)$) and the second output signal ($S_B(t)$). The first local oscillator signal (LO1) and the second local oscillator signal (LO2) are square-wave signals. The apparatus (40) may comprise a third source that provides a third local oscillator signal (LO3). This third local oscillator signal (LO3) can be fed a mixer (43) where a multiplication is performed. If such a third source is used, the means for superpositioning (51) perform a superpositioning of three signals ($S_A(t)$), ($S_B(t)$), and ($S_C(t)$).



— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(88) Date of publication of the international search report:
5 August 2004

INTERNATIONAL SEARCH REPORT

ational Application No

PCT/IB 03/03138

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H03D7/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H03D G01H G01R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 322 024 A (PHILIPS LTD.) 28 June 1989 (1989-06-28) column 3, line 53 - column 4, line 40; figures 1-3	1,12
A	----- GB 2 369 507 A (RAYTHEON CO.) 29 May 2002 (2002-05-29) page 7, line 28 - page 8, line 14 page 10, line 6 - page 11, line 13; figures 1,3	1,12
A	----- US 5 390 248 A (M. SEGAN) 14 February 1995 (1995-02-14) column 5, line 1 - column 6, line 20; figure 3 ----- -/--	1,12



Further documents are listed in the continuation of box C.



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Date of the actual completion of the international search

10 June 2004

Date of mailing of the international search report

17/06/2004

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INTERNATIONAL SEARCH REPORT

ational Application No

PCT/IB 03/03138

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 137 497 A (O. LOWENSCHUSS) 30 January 1979 (1979-01-30) column 2, line 60 - column 4, line 53; figure 1 -----	1,12

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/IB 03/03138

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 0322024	A	28-06-1989	GB 2214014 A	23-08-1989
			EP 0322024 A2	28-06-1989
			US 4914380 A	03-04-1990
GB 2369507	A	29-05-2002	US 6452982 B1	17-09-2002
			AU 7472400 A	10-04-2001
			WO 0118954 A1	15-03-2001
US 5390248	A	14-02-1995	GB 2274341 A	20-07-1994
US 4137497	A	30-01-1979	AU 519665 B2	17-12-1981
			AU 4092778 A	24-04-1980
			CA 1114902 A1	22-12-1981
			DE 2845153 A1	03-05-1979
			FR 2407481 A1	25-05-1979
			GB 2007051 A , B	10-05-1979
			IT 1107971 B	02-12-1985
			JP 1142335 C	13-04-1983
			JP 54074478 A	14-06-1979
			JP 57033550 B	17-07-1982